UNIVERSITI SAINS MALAYSIA

Second Semester Examination
Academic Session 2007/2008

April 2008

REG 261 – Perkhidmatan Bangunan
(Building Services)

Masa: 3 jam
Duration: 3 hours

Sila pastikan bahawa kertas peperiksaan ini mengandungi **TUJUH** muka surat yang tercetak sebelum anda memulakan peperiksaan ini.

*Please check that this examination paper consists of **SEVEN** printed pages before you begin the examination.*

Jawab **LIMA** soalan.

*Answer **FIVE** questions only.*

1. Anda ditugaskan untuk merancang sistem bekalan air untuk satu bangunan pangsapuri mewah 20 tingkat. Terdapat 2 unit kediaman di setiap tingkat.

Dengan bantuan lakaran, huraikan ciri-ciri utama cadangan sistem bekalan air anda. Anda boleh guna sebarang sistem atau cantuman sistem yang difikirkan munasabah. Fakta-fakta yang perlu diambilkira adalah:

- Tekanan paip utama hanya mampu membekalkan air secara langsung kepada tiga tingkat sahaja.

- Pihak Berkuasa Air tidak membenarkan kaedah pam secara langsung dari paip utama.

- Tekanan paip air untuk dua tingkat teratas pangsapuri adalah rendah jika ianya menerima bekalan air dari tangki air atas bumbung.

- Jika tangki air atas bumbung digunakan, tekanan paip air di separuh bawah bangunan adalah terlalu tinggi.

You have been assigned to plan the water supply system for a 20 storey luxury apartment. At every floor there are 2 units.

With the aid of sketches, describe the main characteristics of your proposed water supply system. You can use any system or a combination of systems you deem appropriate. Factors that need to be considered are:

- *The main pipe pressure can only supply direct water supply to 3 floors only.*

- *The Water Authority does not allow direct pumping system from the main pipe.*

- *The water pressure for the top 2 floors is low if they were to receive water supply from the roof water tank.*

- *If roof water tank system is used, the water pressure for the bottom half is too high.*

(20 markah/*marks)*

2. Anda ditugaskan untuk merancang sistem sanitari satu bangunan pejabat 10 tingkat. Setiap lantai ada satu bilik air lelaki dan satu bilik air wanita sahaja. Terdapat 1 unit pejabat di setiap tingkat. Di dalam tandas lelaki terdapat 5 mangkuk tandas, 4 petak urinal dan 5 besin basuh tangan. Di dalam tandas wanita pula terdapat 5 mangkuk tandas dan 5 besin basuh tangan sahaja. Anda boleh mencadangkan **SATU** daripada sistem berikut:

(a) Sistem Dua Paip

(b) Sistem Satu Paip

Dengan bantuan lakaran, huraikan ciri-ciri utama cadangan sistem sanitari anda. Bincangkan juga perbezaan serta kelebihan/kekurangan sistem cadangan anda berbanding sistem yang satu lagi.

You have been assigned to plan the sanitary system of a 10 storey office building. Every floor has one male toilet and one lady toilet only. There is 1 office unit for every floor. In the male toilet there are 5 water closets (WC), 4 urinals and 5 wash basins (wb). In the female toilet there are 5 vwater closets and 5 wash basins only. You can propose ONE of the following systems:

(a) Dual pipe system
(b) One pipe system

With the aid of sketches, describe the main characteristics of your proposed sanitary system. Elaborate also on the differences and advantages/disadvantages of your proposed system in comparison to the other system.

(20 markah/*marks)*

3. Huraikan dengan bantuan lakaran, 5 ciri utama yang perlu ada bagi satu tandas awam yang direkabentuk dengan baik dengan mengambil kira faktor berikut; tatatur, pencahayaan, bahan binaan, peralatan sanitari (besin basuh tangan, mangkuk tandas dan urinal), pengudaraan, kemudahan asas dan keperluan warga kurang upaya.

Describe with the aid of sketches, 5 main characteristics that a good designed public toilet should have taking into consideration the following factors; layout, lighting, construction material, sanitary appliances (wash basin, water closet and urinal), ventilation, basic amenities and the needs of the handicapped.

(20 markah/*marks)*

4. (a) Senaraikan **EMPAT** sumber-sumber api dalam bangunan dan terangkan bagaimana ianya merebak sehingga berlakunya kebakaran yang memusnahkan.

*List **FOUR** sources of fire within a building and describe how they develop into a major conflagration.*

(8 markah/*marks)*

(b) Senaraikan **TIGA** objektif pengesan kebakaran otomatik dan bincangkan **TIGA** jenis operasi pengesan kebakaran.

*List **THREE** objectives of automatic fire detectors and discuss **THREE** types of their operations.*

(12 markah/*marks)*

5. (a) Senaraikan **LIMA** faktor-faktor yang mempengaruhi prestasi lif.

*List down **FIVE** factors that influence the performance of lifts.*

(5 markah/*marks)*

(b) Dapatkan kapasiti satu eskalator dengan sudut kecondongan 35°C, beroperasi pada kadar satu orang bagi setiap pemijak 400 mm lebar dan berkelajuan 0.65 ms^{-1}.

Calculate the capacity of an escalator inclined at 35°C, operating with one person per 400 mm step and at a speed of 0.65 ms^{-1}.

(5 markah/*marks)*

(c) *Sebuah bangunan setinggi 10 tingkat dengan ketinggian lantai 3 m mempunyai 2 buah lif berkapasiti 6 penumpang setiap satu dan berkelajuan 2 ms^{-1}. Lebar bukaan pintu adalah 1.2 m dan dibuka pada kelajuan 0.5 ms^{-1}. Anggarkan masa perjalanan (RTT).*

A building with 10 storeys at 3 m floor to floor spacing, having two lifts with the capacity of six persons per car and 2 ms^{-1} speed of travel. The clear door width is to be 1.2 m and the doors are to open at a speed of 0.5 ms^{-1}. Estimate the round trip time (RTT).

(10 markah/*marks)*

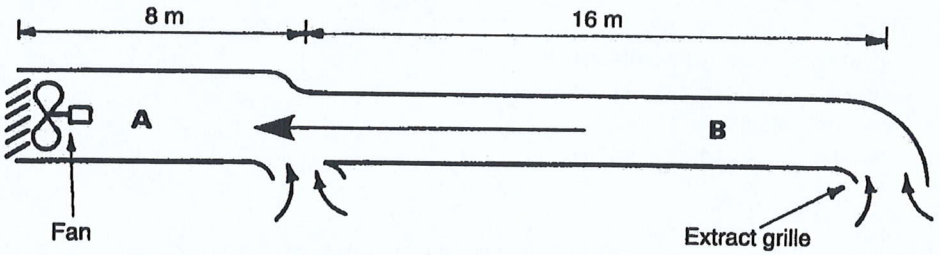
6. (a) Senaraikan komponen-komponen beban haba (dalaman dan luaran) ke dalam sesuatu ruang.

List down components of heat gains (internal and external) into a space.

(7 markah/*marks)*

(b) Sebuah kilang berisipadu 1800 m^3 akan dilengkapkan dengan sistem pengudaraan bekal dan sedut yang memerlukan 6 tukaran udara sejam

A 1800 m^3 volume factory is to have a mechanical supply and extract ventilation system which requires 6 air changes per hour.



Berpandukan gambarajah dan jadual yang diberikan, kira:

i. Saiz saluran udara menggunakan kaedah yang dipilih
ii. Keupayaan kipas.

Referring to the figure and tables given, calculate:

i. The sizes of the ductwork using any chosen methods
ii. The fan rating.

(13 markah/*marks)*

APPENDIX FOR QUESTION 6(b)
LAMPIRAN UNTUK SOALAN 6(b)

Appendix 2 must be submitted together with the answer script.
Lampiran 2 perlu diserahkan bersama skrip jawapan.

1. Recommended maximum ducted air velocities and resistances for acceptable levels of noise

Application	Maximum air velocity (m/s)	Maximum resistance or pressure drop (Pa/m)
Extremely quiet situations such as reading rooms, recording studios and operating theatres	2.5	0.4
Fairly quiet locations, e.g. church, dwellings, private rooms, offices, hospital wards, commercial premises, theatres, restaurants, public buildings, classrooms and conference facilities	6.0	0.6
Less critical situations, such as exhibition centres, factories, workshops, gyms, departmental stores, cafes/fast food centres, warehousing, etc.	10.0	0.8

2. Duct design chart